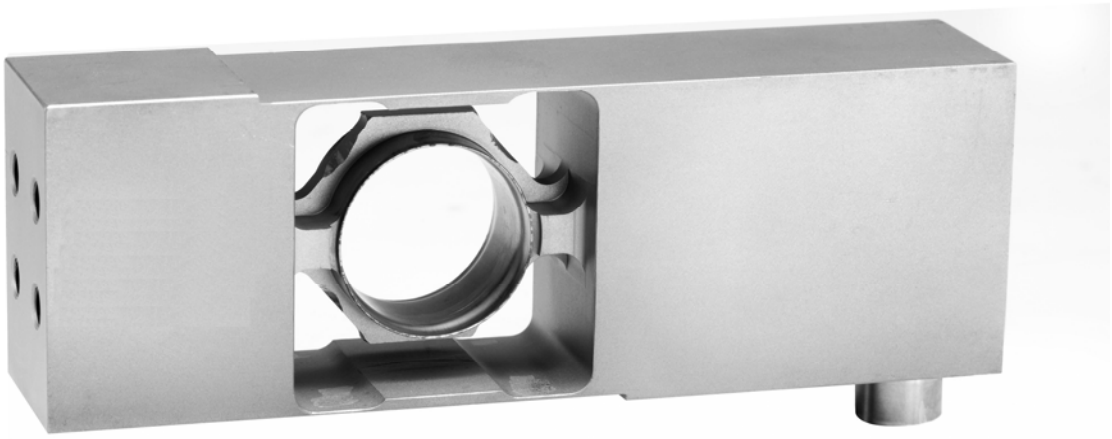
Type PC6D Digital Load Cell

Technical Manual



Document no. G142-Rev1.6-GB

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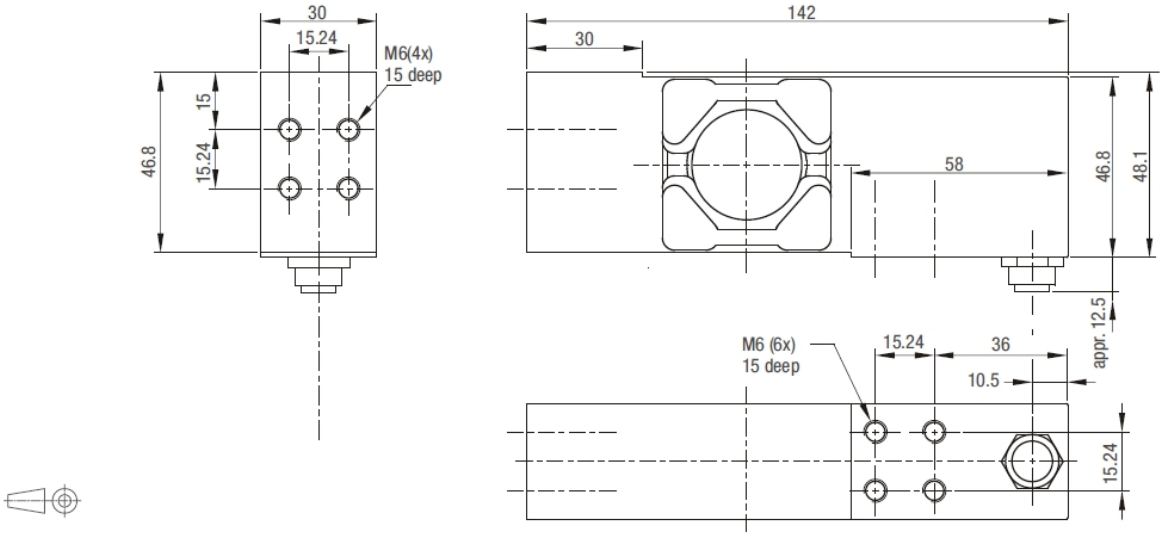
Specifications

Maximum capacity	(E_{max})	kg	20
Accuracy class according to OIML R60			C3
Maximum number of verification intervals	(n_{LC})		3000
Minimum load cell verification interval	(v_{min})		E_{max} /20 000
Temperature effect on minimum dead load output	(TC_0)	%*RO/10°C	≤ ± 0.0070
Temperature effect on sensitivity	(TC_{RO})	%*RO/10°C	≤ ± 0.0100
Combined error		%*RO	≤ ± 0.0200
Non-linearity		%*RO	≤ ± 0.0166
Hysteresis		%*RO	≤ ± 0.0166
Creep error (30 minutes) / DR		%*RO	≤ ± 0.0166
Rated Output	(RO)	counts	± 200 000
Internal resolution		counts	± 260 000
Power supply		V DC	12...24 ± 10% / 32 mA
Switch on current		mA	< 100
Conversion rate internal / external (values per second)			2 400 / up to 1 200
Digital filter			FIR filter 2.5 to 19.7 Hz / IIR filter 0.25 to 18 Hz; programable in 8 steps
CANopen interface			Standard CiA DS301 / 10 k...1 Mbit/s (automatic)
Max. cable length		m	≤ 25 at 1 Mbit/s I ≤ 100 at 500 kbit/s
Bus termination resistor			switchable
EMC			CE 73/23/EEC, 93/98/EEC and 89/336/EEC
Safe load limit			200
Ultimate load		%*E_{max}	300
Safe side load		%*E_{max}	100
Maximum platform size; loading acc. to OIML R76		mm	450 x 450
Maximum off centre distance at maximum capacity		mm	150
Compensated temperature range		°C	–10...+50
Operating temperature range		°C	–10...+50
Storage temperature range		°C	–20...+60
Load cell material			stainless steel 17-4 PH (1.4548)
Sealing			complete hermetic sealing
Protection according EN 60 529			IP68 (up to 2 m water depth) / IP69K

The limits for Non-Linearity, Hysteresis, and TC_{RO} are typical values.
The sum of Non-linearity, Hysteresis and TC_{RO} meets the requirements according to OIML R60 with p_{LC}=0.7.

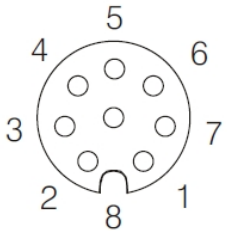
Dimensions (in mm)



Mounting bolts M6 8.8; torque 10 Nm. Torque value assumes oiled threads

Wiring

- The load cell is provided with a M12 female cable connector (type PRKFM, stainless steel)
- The connector housing is connected to the load cell body



Connector pin	Function
8	UB + 24 V DC
1	GND
7	CANH out
3	CANH in
6	CANL out
5	CANL in
2 and 4	not connected

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Part A

1 Introduction

1.1 Identification and Scope

This document describes the system design for a CANopen interface of the PC6D. It describes the protocol used and the CAN open profile used to access the PC6D

1.2 Purpose

The purpose of this document is to specify the functionality, and performance of the PC6D CANopen interface.

1.3 Acronyms and Definitions

1.3.1 Acronyms

This section includes a list of all abbreviations and acronyms used throughout the document in alphabetical order.

CAN	Controller Area Network
CANopen	A higher layer protocol using the CAN.
Function	A software entity that encapsulates some computations and can be used without worrying about its implementation
NMT	Network Management Protocol
PDO	Process Data Object
Process	A software entity that executes a computational entity, including modules and functions.
RPDO	Receive PDO
SDO	Service Data Object
TPDO	Transmit PDO

2 System Detailed Design

2.1 General

This software connects a physical load cell to a CANopen network. The PC6D digitizes, filters and processes the analog inputs. It transports commands, responses and results from and to the CANbus.

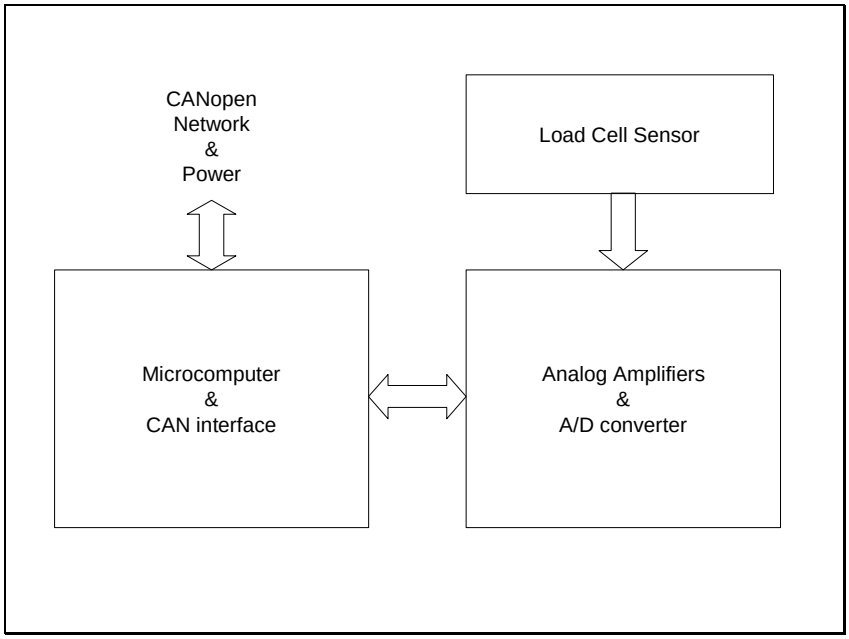

Figure 1- The PC6D Load-Cell

2.2 CANopen

The PC6D follows the CAN2.0B recommendation. It receives both 11-bit identifiers, and tolerates 29-bit identifiers. It only transmits 11-bit identifiers.

The PC6D is always quiet on the CANbus until the NMT Start command is received, except for the very first ‘node guard’ message.

When started, the TPDO1 is used to send current status information. The TPDO1 holds the module status and either net or gross weight, depending on the SDO selection. The default is the Net value.

The TDPO2 is used for reporting ‘on-demand’ average measurements and reporting set-point events.

The TDPO3 is used for reporting change in the Tare value.

In case of an overrun, error or failure an EMERGENCY message is sent to the CAN controller indicating the nature of the error or failure.

EMERGENCY messages are transmitted when the CAN controller tries to set up a module not present, or not functioning, when a module fails to answer the normal backplane scan and when a module comes back online.

The RPDO1 can be used to set/reset Zero and Tare, and for quick selection of the Net weight (default) or Gross weight as the data contained in TPDO1.

The RPDO2 can be used to send software triggers to start average measurements.

RPDO3 and RPDO4 are ignored by the PC6D.

SDOs are handled according to profile and CANopen recommendation.

The NMT protocol will use the ‘node guarding’ method.

The “SDO **Block** Download Protocol” may be implemented later.

3 CANopen profile

3.1 The PDOs

The weight and status is sent constantly to the CANbus. The TPDO1 is sent 20 times per second. The TPDO2 is sent every time the PC6D finishes a triggered measurement or a Set-Point is crossed. The TPDO3 is sent every time the Tare value is changed.

The format of the TPDO1, TPDO2 and TPDO3 is:

32 bit	16 Bit	8 bits	8 Bit
Weight	Module Status	Source	Unused, zero

- The first field is carrying weight information Gross or Net value if it is a TDPO1, Average or Set-Point weight if it is a TPDO2.
  Tare value if TPDO3.

- Then module state follows as a 16 bit field width the following values:
  $0001 - Under range
  $0002 - Over range
  $0004 - Not within Zero range (not yet implemented, zero)
  $0008 - Exactly zero
  $0010 - No motion, still stand, steady state
  $0020 - Tare set
  $0040 - Preset tare (0=tare is measured, 1=tare is set by user)
  $0080 - Invalid weighing (wire-break, A/D ref. out of range)
  $0100 - Set-point 1 (source>limit)
  $0200 - Set-point 2
  $0400 - Set-point 3
  $0800 - Set-point 4
  $1000 - Unused, zero
  $2000 - Unused, zero
  $4000 - Unused, zero
  $8000 - Cold start

- Source is zero in TPDO1 and TPDO3, and has the following meaning in TPDO2:
  0 – (zero) Average result
  1 – Setpoint 1 crossed
  2 – Setpoint 2 crossed
  3 – Setpoint 3 crossed
  4 – Setpoint 4 crossed

The format of the RPDO1 and RPDO2 is:

8 Bit	8 Bit
LDM select	Command byte

Note: On PC6D the LDM selector byte is ignored.

The command byte of RPDO1 is used as follows:

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Cmd:	SnG	SnN			RZ	SZ	RT	ST

Where
- SnG means select Gross Weight
- SnN means select Net Weight
- ST means Set Tare
- RT means Reset (Clear) Tare
- SZ means Set Zero
- RZ means Reset (Clear) Zero

The command byte of RPDO2 is used as follows:

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Cmd:	TR							TS

Where
- TR is a software trigger that starts an average measurement.
- TS Trigger Stop; stop triggered measurement(s).

3.2 Network management

The PC6D implements the Network Management protocol with the node guarding protocol.

The PC6D also implements an address setup feature. The network controller may change a PC6D node address using COB-ID = 0.
The frame must be sent while the PC6D is in its PRE-OPERATIONAL state and it must have the following contents:

8 bits	8 Bit	48 bit (12 BCD digits)
Hex: 55	New CAN-ID	BCD coded serial number

The serial number must be BCD coded and right-justified with as many leading zeros as needed to make 12 BCD digits.

All PC6D on the CANbus will receive the message, but only the PC6D with the serial number given will react to, and echo the frame with 55h changed to AAh. The PC6D will save the new setting immediately and then restart itself.

3.3 Communication Profile

The parameters which are critical for communication are determined in the communication profile.

This includes the data for manufacturer's product nomenclature, for identification, or the parameters for object mapping.

Abbreviations used in Tables:

ro	read only
rw	read / write
wo	write only (read will not be regarded as an error, but returns undefined results)
UI8	Unsigned8
UI16	Unsigned16
UI32	Unsigned32
I32	Signed32
REAL32	32 bit IEEE754 floating point
VS	Visible String

3.4 Object Directory

The object directory of the CANbus communication module is described below:

Communication Profile (Tables)

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
1000	0	Device Type	UI32	ro	00040191H	Device Type <TBD>
1001	0	Error Register	UI8	ro	0	0: No error Bit 0: General error in Gateway Module Bit 4: Error in CAN communication module Bit 7: Manufacturer-specific error
1005	0	COB-ID Sync messg.	UI32	rw	80H	COB-ID of the SYNC object
1006	0	Communication cycle Period	UI32	rw	50000	Minimum interval between TDPO1 (default 20Hz). Min=833 (1200Hz rate).
100C	0	Guard Time	UI16	rw	320	Cycle time in ms, set by the NMT Master or the configuration tool.
100D	0	Life Time Factor	UI8	rw	3	Wait time is set by the NMT Master or the configuration tool.
100E	0	Node guarding identifier	UI32	rw	0x700 + NodeID	Node guarding identifier
1014	0	COB-ID Emergency Message	UI32	rw	80H + NodeID	COB-ID of the Emergency Object
1017	0	Heartbeat Time	UI16	rw	0	Producer Heartbeat time. If index 1017h is nonzero Heartbeat is used, else Node-guard protocol is used.
1018	0 1 2 3 4	Identity Object Vendor ID Product Code Revision Number Serial Number	UI8 UI32 UI32 UI32 UI32	ro ro ro ro ro	4	Number of entries Vendor ID Product Code Revision Number Serial Number
1400	0 1 2	Number of elements COB-ID Transmission type	UI8 UI32 UI8	ro ro ro	2 80000200H + NodeID FFH	Communication parameters of 1st Receive PDO Determined using the CANopen minimum system ID assignment procedure. Asynchronous communication.
1401	0 1 2	Number of elements COB-ID Transmission type	UI8 UI32 UI8	ro ro ro	2 80000300H + NodeID FFH	Communication parameters of 2nd Receive PDO Determined using the CANopen minimum system ID assignment procedure. Asynchronous communication.

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
1401	0 1 2	Number of elements COB-ID Transmission type	UI8 UI32 UI8	ro ro ro	2 80000300H + NodeID FFH	Communication parameters of 2nd Receive PDO Determined using the CANopen minimum system ID assignment procedure. Asynchronous communication.
1402	0 1 2	Number of elements COB-ID Transmission type	UI8 UI32 UI8	ro ro ro	2 400H + NodeID FFH	Communication parameters of 3rd Receive PDO Determined using the CANopen minimum system ID assignment procedure. Asynchronous communication.
1403	0 1 2	Number of elements COB-ID Transmission type	UI8 UI32 UI8	ro ro ro	2 80000500H + NodeID FFH	Communication parameters of 4th Receive PDO Determined using the CANopen minimum system ID assignment procedure. Asynchronous communication.
1600	0 1	Entries in Rx PDO 1 1st Object Cmd. Byte 2nd Object Cmd. Byte	UI8 UI32 UI32	ro ro ro	1 20060108 20060308	Mapping parameters of the 1st Receive-PDO 1st Object is ignored by the PC6D. 2nd Object is a bitwise command:
1601	0 1	Entries in Rx PDO 2 1st Object LDM# 2nd Object Cmd. Byte.	UI8 UI32 UI32	ro ro ro	1 20060108 20060408	Mapping parameters of the 2nd Receive-PDO 1st Object is ignored by the PC6D. 2nd Object is a bitwise command:
1602	0	Number of mapped Entries in Rx PDO 3	UI8	ro	0	Mapping parameters of the 3rd Receive- PDO (disabled)
1603	0	Number of mapped Entries in Rx PDO 4	UI8	ro	0	Mapping parameters of the 4th Receive-PDO (disabled)

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Cmd:	SnG	SnN			RZ	SZ	RT	ST

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Cmd:	TR							TS

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
1800	0	Number of elements	UI8	ro	3	Communication parameters of 1st Transmit PDO
	1	COB-ID	UI32	rw	180H + NodeID	Determined using the CANopen minimum system ID assignment procedure.
	2	Transmission type	UI8	rw	FFH	Asynchronous communication.
	3	Inhibit Time	UI16	rw	10	Transmit inhibit time of PDO in 100 µs steps. A repeated transmission of the PDO is prevented within the defined interval of the inhibit time. Cyclic sending of PDO value (default 20 times / sec.)
1801	0	Number of elements	UI8	ro	3	Communication parameters of 2nd Transmit PDO
	1	COB-ID	UI32	rw	280H + NodeID	Determined using the CANopen minimum system ID assignment procedure.
	2	Transmission type	UI8	rw	FFH	Asynchronous communication.
	3	Inhibit Time	UI16	rw	10	Transmit inhibit time of PDO in 100 µs steps. A repeated transmission of the PDO is prevented within the defined interval of the inhibit time. Event based sending of PDO value (when a dosed value is present)
1802	0	Number of elements	UI8	ro	3	Communication parameters of 3rd Transmit PDO
	1	COB-ID	UI32	rw	380H + NodeID	Determined using the CANopen minimum system ID assignment procedure.
	2	Transmission type	UI8	rw	FFH	Asynchronous communication.
	3	Inhibit Time	UI16	rw	10	Transmit inhibit time of PDO in 100 µs steps. A repeated transmission of the PDO is prevented within the defined interval of the inhibit time. Event based sending of PDO value (when Rx PDO 3 has been processed by the system)
1803	0	Number of elements	UI8	ro	3	Communication parameters of 4th Transmit PDO
	1	COB-ID	UI32	ro	80000480H + NodeID	Determined using the CANopen minimum system ID assignment procedure.
	2	Transmission type	UI8	ro	FFH	Asynchronous communication.
	3	Inhibit Time	UI16	ro	10	Transmit inhibit time of PDO in 100 µs steps. (not used, will not be transmitted)

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
1A00	0	Number of mapped Entries in Tx PDO 1	UI8	ro	4	Mapping parameters of the 1st Transmit-PDO
	1	1st Object	UI32	ro	20010220H	32 bit Integer (default) or float weight value.
	2	2nd Object	UI32	ro	20020110H	Module Status
	3	3rd Object	UI32	ro	20020208H	-*Module ID [0...63]. The current module scanned.
	4	4th Object	UI32	ro	20020308H	-*Gateway Status -*these fields reads 0 (zero) on PC6D
1A01	0	Number of mapped Entries in Tx PDO 2	UI8	ro	4	Mapping parameters of the 2nd Transmit-PDO
	1	1st Object	UI32	ro	20010420H	32 bit Integer (default) or float weight value.
	2	2nd Object	UI32	ro	20020110H	Module Status
	3	3rd Object	UI32	ro	20020208H	Data source (0=average,1..4 = set-points).
	4	4th Object	UI32	ro	20020308H	-*Gateway Status -*this field reads 0 (zero) on PC6D
1A02	0	Number of mapped Entries in Tx PDO 3	UI8	ro	2	Mapping parameters of the 3rd Transmit- PDO
	1	1st Object	UI32	ro	20010320H	32 bit Integer (default) or float tare value.
	2	2nd Object	UI32	ro	20020110H	Module Status
1A03	0	Number of mapped Entries in Tx PDO 4	UI8	ro	0	Mapping parameters of the 4th Transmit-PDO (disabled)

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
2000	0	Number of entries	UI8	ro	6	Number of entries in command input array.
	1	Gross weight	REAL32	ro		Weight values as 32 bit IEEE754 floating point.
	2	Net Weight	REAL32	ro		
	3	Tare	REAL32	ro		
	4	Dosed weight	REAL32	ro		Dosed values always read 0 (zero) on PC6D
	5	Dosed tare	REAL32	ro		
	6	Average weight	REAL32	ro		
2001	0	Number of entries	UI8	ro	11	Number of entries in info array.
	1	Gross weight	I32	ro		Weight and info values as 32 bit signed integer
	2	Net Weight	I32	ro		
	3	Tare	I32	ro		
	4	Dosed weight	I32	ro		Dosed values always read 0 (zero) on PC6D
	5	Dosed tare	I32	ro		
	6	Average weight	I32	ro		
	7	A/D sample	I32	ro		
	8	H&B Device ID	I32	ro		
	9	H&B FW Version	I32	ro		
	A	Device Status	I32	ro		
	B	ADC Reference	I32	ro		
2002	0	Number of entries	UI8	ro	4	Number of objects in the dosed result.
	1	1st Object	UI16	ro		Module Status
	2	2nd Object	UI8	ro		Data source (0=average,1..4=setpoints).
	3	3rd Object	UI8	ro		-*Gateway Status
						-*this field reads 0 (zero) on PC6D
2003	0	Number of entries	UI8	ro	16	Number of bytes in hardware identification array.
	1..16	Hardware ID bytes	UI8	ro		

<table>
<tr><th>Index</th><th>Sub-index</th><th>Name</th><th>Type</th><th>Attri-bute</th><th>Default-value</th><th>Meaning</th></tr>
<tr><td>2004</td><td>0

1
2
3
4
5</td><td>Number of entries.
Save:
Analog output
Calibration
General set-up
Dosing parameters
Set-points</td><td>UI8

UI8
UI8
UI8
UI8
UI8</td><td>ro

wo
wo
wo
wo
wo</td><td>5</td><td>Number of parameters.
Save settings;
save analog output parameters (not PC6D),
save calibration settings,
save general set-up parameters,
save dosing setup parameters (not PC6D),
save set-point parameters.</td></tr>
<tr><td>2006</td><td>0
1
2
3
4</td><td>Number of entries
LDM select [0..63]
Factory Default
Direct command 1
Direct command 2</td><td>UI8
UI8
UI8
UI8
UI8</td><td>ro
wo
wo
wo
wo</td><td>4</td><td>Index 2006 is only for mapping reference (do not access).

Restores the factory defaults, if the TAC is enabled.
Direct bitwise command byte 1 to LDM
Direct bitwise command byte 2 to LDM

Commands bits are:
<table>
<tr><th></th><th>Bit7</th><th>Bit6</th><th>Bit5</th><th>Bit4</th><th>Bit3</th><th>Bit2</th><th>Bit1</th><th>Bit0</th></tr>
<tr><td>Byte1</td><td>SnG</td><td>SnN</td><td></td><td></td><td>ST</td><td>RT</td><td>SZ</td><td>RZ</td></tr>
<tr><td>Byte2</td><td>TR</td><td></td><td></td><td></td><td></td><td></td><td></td><td>TS</td></tr>
</table>
Sng,SnN: select Gross or Net in PDO1(tx),
ST,RT: Set/Reset Tare,
SZ,RZ: Set/Reset Zero,
TR: Software trigger,
TS: Trigger Stop.</td></tr>
<tr><td>2007</td><td>0
1
2
3</td><td>Number of entries
PC6D Bps
PC6D Address
PC6D Bus Config</td><td>UI8
UI8
UI8
UI8</td><td>ro
rw
rw
rw</td><td>2
2
1
1</td><td>Number of parameters
Bits/second: 1=1Mbit, 2=500Kb, 3=250Kb, 4=125Kb, 5=50Kb.
CANopen network address 1 … 126.
CANopen configuration: 1=Terminal Resistor ON, 0=Term.Res. OFF
These values are saved to EEPROM when a write occurs to index 2004sub3 (General setup), and takes effect after next power-on.</td></tr>
</table>

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
2100	0	Number of entries.	UI8	ro	19	Number of parameters.
	1	1st Parameter	I32	rw		-*Analog source
	2	2nd Parameter	I32	rw		-*Analog high
	3	3rd Parameter	I32	rw		-*Analog low
	4	4th Parameter	I32	rw		Filter setting
	5	5th Parameter	I32	rw		-*Filter Factor
	6	6th Parameter	I32	rw		-*Digital Outputs
	7	7th Parameter	I32	rw		-*Digital Inputs
	8	8th Parameter	I32	rw		Measuring Time
	9	9th Parameter	I32	rw		Filter mode
	A	10th Parameter	I32	rw		No-motion range
	B	11th Parameter	I32	rw		No-motion time
	C	12th Parameter	I32	rw		-*Digital outputs mask
	D	13th Parameter	I32	rw		Tare
	E	14th Parameter	I32	rw		Start Delay
	F	15th Parameter	I32	rw		Trigger Edge
	10	16th Parameter	I32	rw		Trigger Level
	11	17th Parameter	I32	rw		Update rate
	12	18th Parameter	I32	rw		Zero track (TAC protected)
	13	19th Parameter	I32	rw		Δ Time -*not implemented on PC6D

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
2300	0	Number of entries.	UI8	ro	12	Number of calibration parameters.
	1	Absolute gain	I32	rw		-*Absolute gain calibrate (TAC protected)
	2	Absolute zero	I32	rw		-*Absolute zero calibrate (TAC protected)
	3	Calibrate enable	I32	rw		Calibrate enable (enables TAC when the TAC is written)
	4	Calibrate gain	I32	rw		Calibrate gain (TAC protected)
	5	Set calibration point B	I32	rw		-*Set calibration point B
	6	Set calibration point A	I32	rw		-*Set calibration point A
	7	Calibrate max	I32	rw		Calibrate max (TAC protected)
	8	Calibrate min	I32	rw		Calibrate min (TAC protected)
	9	Calibrate save	I32	rw		Calibrate save (TAC protected)
	A	Calibrate zero	I32	rw		Calibrate zero (TAC protected)
	B	Decimal point	I32	rw		Decimal point (TAC protected)
	C	Display step size	I32	rw		-*Display step size (TAC protect)
	D	Local gravity	I32	rw		Adjust calibration of **zero and gain** according to new entered gravity vs. gravity of factory calibration. Remark: Proceeding factory default (2006 sub 2) changes local gravity back to factory calibration. -*not implemented on PC6D
2500	0	Number of entries.	UI8	ro	8	Number of Check-Weigher parameters
	1	Trigger Level	I32	rw		Trigger Level
	2	Trigger Egde	I32	rw		Trigger Egde
	3	ReTrigWindow	I32	rw		ReTrigWindow
	4	ReTrigTime	I32	rw		ReTrigTime
	5	HoldTime	I32	rw		HoldTime
	6	TareWindow	I32	rw		TareWindow
	7	TareTime	I32	rw		TareTime
	8	ReTrigStop	I32	rw		ReTrigStop

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
2600	0 1 2 3 4	Number of entries. Set-point 1 Set-point 2 Set-point 3 Set-point 4	UI8 I32 I32 I32 I32	ro rw rw rw rw	4	Number of Set-point parameters. Set-point 1 value Set-point 2 value Set-point 3 value Set-point 4 value
2700	0 1 2 3 4	Number of entries. Set-point 1 Set-point 2 Set-point 3 Set-point 4	UI8 I32 I32 I32 I32	ro rw rw rw rw	4	Number of Set-point parameters. Set-point 1 hysteresis Set-point 2 hysteresis Set-point 3 hysteresis Set-point 4 hysteresis
2800	0 1 2 3 4	Number of entries. Set-point 1 Set-point 2 Set-point 3 Set-point 4	UI8 UI8 UI8 UI8 UI8	ro rw rw rw rw	4	Number of Set-point parameters. Set-point 1 source Set-point 2 source Set-point 3 source Set-point 4 source

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
2900	0	Number of entries	UI8	ro	11	Number of entries in info array.
	1	Gross weight	I32	ro		Weight and info values as 32 bit signed integer
	2	Net Weight	I32	ro		
	3	Tare	I32	ro		
	4	Dosed weight	I32	ro		
	5	Dosed tare	I32	ro		
	6	Average weight	I32	ro		
	7	A/D sample	I32	ro		
	8	Device ID	I32	ro		
	9	Firmware Version	I32	ro		
	10	Device Status	I32	ro		
	11	ADC Reference	I32	ro		

Index	Sub-index	Name	Type	Attri-bute	Default-value	Meaning
6401	0 1 2 3 4 5 6	Number of entries Gross weight Net Weight Tare Dosed weight Dosed tare Average weight	UI8 I16 I16 I16 I16 I16 I16	ro ro ro ro ro ro ro	6	Number of entries in the 16 bit analog input module These entries are mandatory according to DS401. They are the same as for index 6402, but shifted 8 bits to the right (value/256). Dosed values always read 0 (zero) on PC6D
6402	0 1 2 3 4 5 6 7	Number of entries Gross weight Net Weight Tare Dosed weight Dosed tare Average weight A/D sample	UI8 I32 I32 I32 I32 I32 I32 I32	ro ro ro ro ro ro ro ro	7	Number of entries in the 32 bit analog input module These values are the internal long integer representation of the weight (the integer values are multiplied by 10^dp [2300sub0B]). Index 6402 is a sub-set of index 2001. Dosed values always read 0 (zero) on PC6D
6403	0 1 2 3 4 5 6	Number of entries Gross weight Net Weight Tare Dosed weight Dosed tare Average weight	UI8 REAL32 REAL32 REAL32 REAL32 REAL32 REAL32	ro ro ro ro ro ro ro	6	Number of entries in the float analog input module These values are the floating-point representation of the weight as they are transmitted in the PDO1(tx). Index 6403 is a replica of index 2000. Dosed values always read 0 (zero) on PC6D

3.5 Quick Start Guide

Notes:

- The PC6D is always quiet on the CANbus until the NMT Start command is received, except for the very first 'node guard' message.
- Default setting for PC6D is CANopen address 1 @ 500 kbit/sec.

3.5.1 Process data objects

TPDO1

- Weight values are available at all times (see page 7 or 9)
- The following table shows the information of TPDO1 (8 byte, firmware 102.183):

32 bit	16 Bit	8 Bit	8 Bit
Weight	Module Status	Module number	Gateway State

Remark: special firmware (version 102.186) supporting 6 byte available on request

Weight	Module Status	0	0

- Default : net weight.
- Refresh time: every 50 ms per channel, see note below.
- Format: Floating point single precision (IEEE 754)

Note:

A timer is controlled by index 1006 which is a silence time after transmission of a TPDO1 in which no further TPDO1 messages is sent regardless of the output rate from the ADC and filter system. This timer only applies to TPDO1.

This means that the default filter setting FL=3, type IIR, UR=0 produces 1200 samples. But the default value 50000 µs in index 1006 means that only every 60th sample is actually transmitted, the 59 others are blocked by this timer.

On the other hand if you use a FIR filter with FL=8 you will only get a maximum of 150 measurements per second even if you try to set the index 1006 to 100 µs (10kHz). UR will have the usual effect.

TPDO2

8 byte format as TPDO1, except the "Module Number" contains a code:

0 => Average weight (is available and refreshes when a new value is ready)
1=> Setpoint 1 crossed
2=> Setpoint 2 crossed
3=> Setpoint 3 crossed
4=> Setpoint 4 crossed

TPDO3

8 byte format as TPDO1. It is sent every time the tare changes and value set is the new tare value.

32 bit	16 Bit	8 Bit	8 Bit
Weight	Module Status	0	0

RPDO1

- The following commands can be executed direct (see Index 1600):

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Cmd:	SG	SN			ST	RT	SZ	RZ
	128	64			08	04	02	01

Examples:
- Setting tare for channel 2: transmit RPDO1 [01 08]
- Setting gross weight in TPDO1 for channel 1: transmit RPDO1 [00 128]

RPDO2

- The following commands can be executed direct (see Index 1601):

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Cmd:	TR							TS
	128							01

Example:
- Setting trigger start for channel 5: transmit RPDO1 [04 128]

3.5.2 Service data objects

SDO's

- Are only available on request
- See tables 3.3 Object Directory
- Can be used for complete setup of the System MCS-64 via CANbus master, e.g.:
  - Filter setting channel 1: Index 2100, Subindex 4
  - Filter Mode setting channel 3: Index 2102, Subindex 9
- Can be used to get information regarding all the commands available, e.g.:
  - Net weight channel 1: Index 2900, Subindex 2
  - AD sample channel 3: Index 2902, Subindex 7

Note: Index 2000 and 2001 refer to the CANbus standards (document DS 301, which is available on request). Using Index 2000 and 2001 you will only get the weight information (no channel info). Using Index 2900 – 293F you get the weight and channel information.

4 Notes

At PC6D you can download firmware updates:

- via CANopen or
- via PC.

*4.1 **Firmware Update** (via CANopen)*

This piece of firmware resides in Flash memory block 0 and 5. Its primary function is to load new software versions to Flash blocks 1 … 4.

This is used to allow firmware update through the CANbus using a special protocol. Please ask Flintec for the description.

*4.2 **Firmware Update** (via PC)*

For this purpose we have a special programmer software for an easy download of the firmware. Additional you need a converter “RS232/CANbus” or “USB/CANbus”. We recommend the a converter “USB/CANbus”.

For CANbus communication via PC (Win2000/XP) with USB-port you can use:

PCAN-USB-Adapter

Supplier: PEAK-System Technik GmbH, D-64293 Darmstadt

article no. IPEH-002021

www.peak-system.com / info@peak-system.com

Part B

5 COMMANDS

These pages describe the ASCII commands as they must be used e.g. by the DOP software. At each command the equivalent CAN index and sub-index are given for reference.

For better clarity, all commands are divided into groups as described on the following pages.

PART B **25**

5 COMMANDS **25**

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5.1 System Diagnosis Commands – ID, IV, IS

Use these commands to get type, firmware version or device status of PC6D. These commands are sent without parameters.

ID Request of device identity **[2900sub08]**

Master (PC / PLC) sends	Devices responds
ID	**D:2010**

The response to this request gives the actual identity of the active device. This is particularly useful when trying to identify different device types on a bus.

IV Request of firmware version **[2900sub09]**

Master (PC / PLC) sends	Device responds
IV	**V:0100**

The response to this request gives the firmware version of the active device.

IS Request device status **[2900sub0A]**

Master (PC / PLC) sends	Device responds
IS	**S:067000 (example)**

The response to this request comprises of two 3-digit decimal values, which can be decoded according to the table below:

Leftmost 3-digit value:	Rightmost 3-digit value:
1 Signal stable	1 (not used)
2 Zero action performed	2 (not used)
4 Tare active	4 (not used)
8 (not used)	4 (not used)
16 Setpoint 0 active	4 (not used)
32 Setpoint 1 active	4 (not used)
64 Setpoint 2 active	4 (not used)
128 Setpoint 3 active	4 (not used)

The example decodes the result S:067000 as follows:

Signal stable (no-motion) 1
Zero action 2
Output 2 active 64 (only as software value)

Total 67

Note: the bits that are not used are set to zero.

5.2 Calibration Commands – CE, CM, DS, DP, CZ, CG, ZT, FD, CS

Note: TAC represents Traceable Access Code (calibration counter).

CE TAC counter reading **[2300sub03]**

With this command you get the TAC counter reading or you can enable a calibration sequence.

Master (PC / PLC) sends	Device responds	Result
CE	**E+00017** (example)	Request: TAC-counter CE 17
CE_17	**OK**	Calibration sequence active

This command must be issued PRIOR to any attempt to set the calibration parameters CZ, CG etc. In legal for trade applications the TAC counter can be used to check if critical parameters have been changed without re-verification. After each calibration the TAC counter increases by 1.

CM Set maximum output value **[2300sub07]**

This command is used for setup the maximum output value. Permitted values are between 1…200000.

Master (PC / PLC) sends	Device responds	Result
CM	**M+30000**	Request : CM = 30000
CE	**E+00017** (example)	Request: TAC-counter CE 17
CE_17	**OK**	Calibration sequence active
CM_50000	**OK**	Setting: CM = 50000

This value will determine the point at which the output will change to “oooooo”, signifying over-range.

Note: The range, in which a scale can be set to zero (SZ) or automatic zero tracking (ZT) is active, is +/- 2% of CM value.

Factory default: CM = 99999.

DS Display step size **[2300sub0C]**

This command allows the output to step up or down by a unit other than 1. Permitted values are 1, 2, 5, 10, 20, 50, 100 and 200.

Master (PC / PLC) sends	Device responds	Result
DS	**S+00002**	Request : display step size 2
CE	**E+00017** (example)	Request: TAC-counter CE 17
CE_17	**OK**	Calibration sequence active
DS_50	**OK**	Setting: DS = 50

DP Set decimal point position **[2300sub0B]**

This command allows the decimal point to be positioned anywhere between leftmost and rightmost digits of the 5-digit output result. Position 0 means no decimal point.

Master (PC / PLC) sends	Device responds	Result
DP	**P+00002**	Request : position of dec. point
CE	**E+00017** (example)	Request: TAC-counter CE 17
CE_17	**OK**	Calibration sequence active
DP_0	**OK**	Setting: no decimal point

CZ Set calibration zero point **[2300sub0A]**

This is the reference point for all weight calculations, and is subject to TAC control.

Master (PC / PLC) sends	Device responds	Result
CE	**E+00017** (example)	Request: TAC-counter CE 17
CE_17	**OK**	Calibration sequence active
CZ	**OK**	Zero point set

Factory default: approx. 0 mV/V input signal

CG Set calibration gain (span) value **[2300sub04]**

This is the reference point for calibration under load, and is subject to TAC control.
Permitted values are 1…250000.

Master (PC / PLC) sends	Device responds	Result
CG	**G+20000**	Request : span 20000d
CE	**E+00017** (example)	Request: TAC-counter CE 17
CE_17	**OK**	Calibration sequence active
CG_50000	**OK**	Setting: span 50000d

For calibration an input signal near the display maximum (CM) will give the best system performance. The minimum calibration load of at least 20% is recommended.

Factory correct calibration default: 200000 d = 2.000 mV/V input signal = 20 kg

ZT Zero tracking **[2100sub12]**

This command enables or disables the zero tracking. Parameter = 0 disables the zero tracking and parameter = 1 enables the zero tracking. Issuing the command without any parameter returns the current ZT value.

Master (PC / PLC) sends	Device responds	Result
ZT	**Z:001**	Request : ZT status (ON)
CE	**E+00017** (example)	Request: TAC-counter CE 17
CE_17	**OK**	Calibration sequence active
ZT_0	**OK**	Setting: ZT = OFF

Zero tracking will be performed only on results less than +/-0.5 d at a rate of 0.4 d/sec, where d = display step size (see DS command). The zero can only be tracked to +/- 2% of maximum (see CM command).

Factory default: ZT=0

FD Factory default settings **[2006sub02]**

This command puts the PC6D back to a known state. The data will be written to the EEPROM and the TAC will be incremented by 1.

Note: All calibration and setup information will be lost by issuing this command!
Only the factory temperature correction table and serial number are preserved.

Master (PC / PLC) sends	Device responds	Result
CE	**E+00017** (example)	Request: TAC-counter CE 17
CE_17	**OK**	Calibration sequence active
FD	**OK**	Factory default setting

CS Save the calibration values **[2004sub02]**

This command results in the calibration values being saved to EEPROM, and causes the TAC to be incremented by 1.

Master (PC / PLC) sends	Device responds	Result
CE	**E+00017** (example)	Request: TAC-counter CE 17
CE_17	**OK**	Calibration sequence active
CS	**OK**	Calibration values saved

The CS command saves all of the calibration group values, as set by CZ, CG, CM, DS, DP and ZT. The command returns ERR and has no updating action unless it is preceded by the CE_XXXXX.

5.3 Motion detection Commands – NR, NT

The motion detection facility provides a means of disabling certain functions whenever a condition of instability, or “motion”, is detected. The “no-motion”, or “stable” condition is achieved whenever the signal is steady for the period of time set by NT, during which it cannot fluctuate by more than NR increments.The stable condition activates the relevant bit of responses to “Info Status” (IS).

The following functions are disabled if motion is detected: “Calibrate Zero” (CZ) “Calibrate Gain” (CG) “Set Zero” (SZ) and “Set Tare” (ST).

NR No Motion range **[2100sub0A]**

This is the range within which the weighing signal is allowed to fluctuate and still be considered as “stable”. Permitted values are between 0 and 65535.

Master (PC / PLC) sends	Device responds	Result
NR	**R+00010**	Request: NR = 10 d
NR_2	**OK**	Setting: NR = 2
WP	**OK**	Setting saved

NR = 2 i.e. fluctuations within a maximum of ± 2 d, in the period NT, will be considered “stable”.

Factory default: NR = 1.

NT Stabilisation time for in motion band **[2100sub0B]**

This sets the time (in milliseconds) over which the weight signal is checked to see if it is “stable” or has “no-motion“. The weight signal has to vary by less than NR divisions over the time period NT to be considered ‘stable’.
Permitted range 0-65535 milliseconds.

Master (PC / PLC) sends	Device responds	Result
NT	**T+01000**	Request: NT = 1000 ms
NT_500	**OK**	Setting: NT = 500 ms
WP	**OK**	Setting saved

If the value of NT =500 milliseconds, the output must not fluctuate more than NR increments within 500 milliseconds in order to be considered “stable”.

Factory default: NT = 1000 [=1000 ms].

5.4 Filter setting Commands – FM, FL, UR

Using the commands FM and FL, a digital filter type and strength can be set which will eliminate most of the unwanted disturbances. The command UR is used for the average building. Please note that these filters are positioned immediately after the A/D Converter and therefore affect all aspects of the weighing operation.
[Please read the note TPDO1 regarding index 1006 on page 22]

FM Filter Mode FIR / IIR **[2100sub09]**

Choose filter mode, permitted values are “0” for IIR and “1” for FIR.

Master (PC / PLC) sends	Device responds	Result
FM	**M+00001**	Request: FM = 1 (FIR)
FM_0	**OK**	Setting: FM = 0 (IIR)
WP	**OK**	Setting saved

The digital IIR filter works as a low-pass filter of 2nd order with Gaussian characteristic, damping is 40 dB/decade; see table mode 0.

The digital FIR filter works as a low-pass filter with quick response; damping see table mode 1.

Factory default: 0

FL Setup filters **[2100sub04]**

Command for setup cut off frequency, permitted values are 0 … 8.

Master (PC / PLC) sends	Device responds	Result
FL	**F+00003**	Request: FL = 3
FL_1	**OK**	Setting: FL = 1
WP	**OK**	Setting saved

Filter values can be chosen between 0 and 8, see table below.
FL= 0 means no filter in mode 0 or 1 (command FM).

Factory default: 3

Mode 0 Characteristic (IIR-Filter)

FL	Settling time to 0.1% (ms)	3dB Cut-off frequency (Hz)	Damping @300Hz (dB)	Output-rate* (samples/s)
0	no filtering	**		1200
1	55	18	57	1200
2	122	8	78	1200
3	242	4	96	1200
4	322	3	104	1200
5	482	2	114	1200
6	963	1	132	1200
7	1923	0.5	149	1200
8	3847	0.25	164	1200

***** Output-rate = $1200/2^{UR}$ samples/s ** Antialiasing filter 17 Hz @ 60 dB/dec

Mode 1 Characteristic (FIR-Filter)

FL	Settling time to 0.1% (ms)	3 dB Cut-off (Hz)	20 dB damping at frequency (Hz)	40 dB damping at frequency (Hz)	Damping in the stopband (dB)	Stopband (Hz)	Output rate max. (samples/s)
0	no filtering	**					1200
1	47	19.7	48	64	>90	>80	1200
2	93	9.8	24	32	>90	>40	600
3	140	6.5	16	21	>90	>26	400
4	187	4.9	12	16	>90	>20	300
5	233	3.9	10	13	>90	>16	240
6	280	3.2	8	11	>90	>13	200
7	327	2.8	7	9	>90	>11	172
8	373	2.5	6	8	>90	>10	150

** Antialiasing filter 17 Hz @ 60 dB/decade

Attention: In mode 1 the output rate is dependant on the selected filter level (FL) and will be automatically adjusted by the PC6D.

UR Set the update rate (average building) **[2100sub11]**

This command will define over how many measurements, from the preceeding IIR or FIR filter, an average will be calculated. The average will be calculated over 2^{UR} samples. Permitted values 0...7 (see table below).

UR	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
No. of samples	1	2	4	8	16	32	64	128

Check / adjustment update rate:

Master (PC / PLC) sends	Device responds	Result
UR	**U+0001**	Request: average over 2 samples
UR_4	**OK**	Setting: average over 16 samples

Factory default: 0 [no average, = 1200 samples/s]

Remark to Mode 1

Dependency Output Rate - averaging UR - Filter FL

UR	Output Rate samples/s								
	FL0	FL1 19.7 Hz	FL2 9.8 Hz	FL3 6.5 Hz	FL4 4.9 Hz	FL5 3.9 Hz	FL6 3.2 Hz	FL7 2.8 Hz	FL8 2.5 Hz
0	1200	1200	600	400	300	240	200	172	150
1	600	600	300	200	150	120	100	85.7	75
2	300	300	150	100	75	60	50	43	37.5
3	150	150	75	50	37.5	30	25	21.4	18.7
4	75	75	37.5	25	18.7	15	12.5	10.7	9.4
5	37.5	37.5	18.7	12.5	9.4	7.5	6.26	5.36	4.68
6	18.7	18.7	9.4	6.26	4.68	3.76	3.12	2.68	2.34
7	9.4	9.4	4.68	3.12	2.34	1.88	1.56	1.34	1.18

5.5 Set Zero/Tare and Reset Zero/Tare Commands – SZ, RZ, ST, RT

The following commands allow you to set and reset zero and tare values. The zero set during calibration remains the 'true zero' but new 'current zero' can be set using the SZ command. If the SZ command is issued and accepted then all weight values will then be based on the new 'current zero'. Please remember that zero value will be subject to the Zero tracking function if enabled.

If the weight signal is not stable (as defined by the No motion range NR and the No motion time NT) then both the set zero SZ and set tare ST commands will be disabled.

Also the Set Zero SZ command is not allowed if the new zero value required and the 'calibration zero' differ by more than 2 % of the CM value (maximum allowable value).

SZ Set Zero **RPDO1 [00 02]**

This command sets a new "current zero" which is then the basis of all weight values until further updated by the zero tracking function, another SZ command or the "reset zero" command RZ. The SZ command will fail (LDU responds with ERR) if the new "current zero" is more than 2% (of the CM value) higher or lower than the "true zero" set during calibration. The SZ command will also fail if the weight signal is not stable as defined by the No motion range (NR) and the No motion time (NT). If the weight signal is "stable", the response to the IS command (Device Status) will show the "signal stable" bit active and the SZ command will be accepted (OK). If the "signal stable" bit is not active, the SZ command will be rejected and the LDU will respond with ERR (error).

Master (PC / PLC) sends	Device responds	Result
SZ	**OK**	Set Zero performed

The SZ command is issued without any parameters and will return either the OK or ERR response. If the SZ command is accepted the PC6D responds with OK and the "zero action performed" bit of the device status (IS) response will be active.
Is the command acknowledged by the PC6D with OK, the status bit for Zero (request IS) is set to 1. A renewed SZ command or the reset zero command [RZ] changes the current zero point. The command is not implemented, if the current measured value is more than ±2% of the maximum display value [CM] of calibrated zero point [CZ].
PC6D response is ERR (error).

RZ Reset Zero Point **RPDO1 [00 01]**

This command cancels the SZ command and the zero reading reverts to that set by the CZ command during calibration.

Master (PC / PLC) sends	Device responds	Result
RZ	**OK**	Zero point CZ active again

The PC6D responds to the RZ command with either OK or ERR. If OK is returned then the "zero action performed" bit in the Device Status (IS) response will be set to "0".

ST Set Tare **RPDO1 [00 08]**

This command will activate the net weighing function by storing the current weight value as a tare.

The weight signal must be “stable” within the limits set by NR (No Motion Range) and NT (No Motion Time) commands for the “signal stable” bit to be active and set tare command to be accepted.

Master (PC / PLC) sends	Device responds	Result
ST	**OK**	Tare performed

If the weight signal is “stable”, the response to the IS command (Device Status) will show the “signal stable” bit active and the ST command will be accepted (OK). If the “signal stable” bit is not active, the ST command will be rejected and the LDU will respond with ERR (error).

RT Reset Tare **RPDO1 [00 04]**

The weighing signal returns to gross mode.

Master (PC / PLC) sends	Device responds	Result
RT	**OK**	Tare deactivated

The PC6D responds to the RT command with either OK or ERR. If OK is returned then the “tare active” bit in the Device Status (IS) response will be set to “0”.

5.6 Output Commands – GG, GN, GT, GS

The following commands “Get” the Gross, Net, Tare and ADC (Sample) values from the PC6D. Available on the CAN profile index 2000 and 2001 in floating point and integer respectively.

GG Get Gross value **[2000/2001sub01]**

Normally sent in TPDO1, if selected by index 1A00sub01.

Master (PC / PLC) sends	Device responds	Result
GG	**G+01.100**	Gros weight 1.100 d

GN Get Net value **[2000/2001sub02]**

Normally sent in TPDO1, if selected by index 1A00sub01.

Master (PC / PLC) sends	Device responds	Result
GN	**G+01.000**	Net weight 1.000 d

GT Get Tare value **[2000/2001sub03]**

Master (PC / PLC) sends	Device responds	Result
GT	**T+00.100**	Tare weight 100 d

GS Get ADC Sample value **[2900sub07]**

This command gets the actual Analogue to Digital Converter (ADC) value. This can be useful during development or when calibrating to see how much of the ADC range is being used.

Master (PC / PLC) sends	Device responds	Result
GS	**S+125785**	AD-value = 125.785 d

For service applications, it is helpful to note the GS values for the “no-load” or “zero” output and when the “calibration load” is applied.

5.7 Setpoint Commands - Sn, Hn, An

The PC6D has 4 setpoints where the status is dependent on the weight value. Each of them can be assigned as an independent setpoint value (Sn) with a corresponding hysteresis/switch action (Hn) and base (An – switch on the gross or the net weight).

S1 Setpoint 1 **[2600sub01]**

Request / Setting

Master (PC / PLC) sends	Device responds	Result
S1	**1+01500**	Setpoint S1 = 1500 d
S1_03000	**OK**	Setting: Setpoint S1 = 3000 d

Similarly to read or set setpoint 2, use S2 instead of S1, etc. **(2600sub02)**

H1 Hysteresis setpoint 1 **[2700sub01]**

Using the H1 command, the hysteresis on the setpoint value is set by the numeric value and the polarity of this numeric value defines whether the setpoint switches on or off when the setpoint value is reached.

Example

Setpoint	Hysteresis	Load	OFF	ON
S1 = 20.00 kg	H1 = -1.00 kg	increasing	≥ 21.01 kg	0 ... 21.00 kg
S1 = 20.00 kg	H1 = -1.00 kg	decreasing	≥ 20.00 kg	19.99 ... 0 kg
S1 = 20.00 kg	H1 = 1.00 kg	increasing	0... 19.99 kg	≥ 20.00 kg
S1 = 20.00 kg	H1 = 1.00 kg	decreasing	19.00. ..0 kg	≥ 19.01 kg

Example of negative hysteresis of 1.00 kg (H1 = -100) on a setpoint (S1) of 20.00 kg (lines 1 & 2 of table above):

When the weight is increasing between 0 kg and 21.00 kg the setpoint is “ON”. Once the weight increases above 21.00 kg then the logic output is “OFF”. The setpoint will come “ON” again when the weight value drops below 20.00 kg.

Example of positive hysteresis of 100 kg (H1 = +1.00) on a setpoint of 20.00 kg (lines 3 & 4 of table above):

When the weight is increasing between 0 kg and 19.99 kg the setpoint is “OFF”. Once the weight increases above 19.99 kg then the setpoint is “ON”. The setpoint will switch “OFF” again when the weight value drops below 19.00 kg.

Request / Set Hysteresis value for setpoint 1

Master (PC / PLC) sends	Device responds	Result
H1	**1-00100**	Request: neg. Hysteresis
H1_100	**OK**	Setting: pos. Hysteresis
H1_-100	**OK**	Setting: neg. Hysteresis

Setpoint range between ± 1 (minimum) and ± 199999 (maximum).

Similarly to read or set the setpoint 1 hysteresis, use H2 instead of H1 etc. **(2700sub02)**

A1 Request / Set the base for setpoint 1 **[2800sub01]**

The A1 command defines the base on which the setpoint value acts. If A1 is set to “0” then setpoint 1 acts on the unfiltered gross weight. If A1 is set to “1” then setpoint 1 acts on the unfiltered net weight.

A1 = 0	Not filtered gross weight
A1 = 1	Not filtered net weight

Request / Set base for setpoint 1

Master (PC / PLC) sends	Device responds	Result
A1	**1+00000**	Allocation gros weight
A1_1	**OK**	Allocation net weight

Similarly to read or set the setpoint 1 base, use A2 instead of A1 etc. **(2800sub02)**

The PC6D transmits one TPDO2 every time a setpoint changes state. The weight sent in the TPDO2 is the weight that caused the TPDO2 to be transmitted, Net or Gross as selected for the actual setpoint. The TPDO2 also holds the Weighing status flags and the setpoint Number.
If two (or more) setpoint have exactly the same settings the setpoint with the higher number will be “hidden”.

NOTE: All changes to the setpoint settings have to be stored in EEPROM using the SS command. See section 5.10.

5.8 Communication setup Commands – AD, BR, Terminal Resistor

NOTE: These settings will only take effect after a power on reset (remember to store the settings using the WP command [2004sub03] before turning the power off.)

AD Device address setup / request **[2007sub02]**

It is possible to set the network address of the device using the AD command. (Address range between 1 and 126).

Note: Setting the device address to 0 or 127 are not allowed. Address 0 is used by the Network Management Protocol (NMT).

Request

Master (PC / PLC) sends	Device responds	Result
AD	**A:001**	Request: Address 1
AD_49	**OK**	Setting: Address 49

Factory default: Address 1

BR Request / Setup CAN Speed **[2007sub01]**

With this command the following bits/second rates can be setup:
- 1 = Mbit
- 2 = 500 kbit/s
- 3 = 250 kbit/s
- 4 = 125 kbit/s
- 5 = 50 kbit/s

Master (PC / PLC) sends	Device responds	Result
BR	**B:001**	Request: CAN speed 1 Mbit /s
BR_2	**OK**	Setting: CAN speed 500 kbit/s

Factory default: 500 kbit/s.

Terminal Resistor ON / OFF **[2007sub03]**

A build in terminal resisitor is switchable via CANopen
- 1 = ON
- 0 = OFF

Factory default: ON.

5.9 Trigger Commands – SD, MT, GA, TE, TR, TL

Note: All setups should be stored with the WP command before power off.

SD Start Delay **[2500sub0A]**

Set the delay between falling/rising edge of trigger pulse and start of measurement.
Permitted values are 0 … 65535 ms.

Master (PC / PLC) sends	Device responds	Result
SD	**S+00100**	Request: SD=100 ms
SD_200	**OK**	Setting: SD=200 ms

Factory default: 0 [= 0 ms]

MT Measuring Time **[2500sub09]**

Set the time over which the average value will be built.
Permitted values are 0 …65535 ms.

Master (PC / PLC) sends	Device responds	Result
MT	**M+00100**	Request: MT=100 ms
MT_500	**OK**	Setting: MT=500 ms

Note: MT = 0 means disabled trigger and average function.

Factory default: 0

GA Get Average **[2900sub06]**

Issuing the GA command the PC6D returns the latest average weight value by using the MT setup. On PC6D it is not necessary to ask for this. The average result is sent in a TPDO2 when ready, or re-triggered.

Master (PC / PLC) sends	Device responds	Result
GA	**A+01.100**	Answer: GA=1.100 g

Note: During the time between the trigger condition being accepted and the average value being updated, the GA command will return the value 99999 when it has been triggered or 88888 when it has been retriggered or 99996 when the system tried to change Tare or Zero before end of measurement.

[Remark: When started this function, the latest average weight is availabe in TPDO2.]

TL Trigger Level **[2500sub01]**

Set the trigger level for rising edge start of measurement. Permitted values are in the range 0…262143.

Master (PC / PLC) sends	Device responds	Result
TL	**T+99999**	Request: TL=99999
TL_1000	**OK**	Setting: TL=1000

With regard to the trigger commands SD and MT, a check weighing will automatically start when the weight overshoots by e.g. 1.000d (increments), e.g. 100,0 g.

Factory default: 199999

TE Trigger Edge **[2500sub02]**

Issuing the TE command selects rising or falling edge trigger. Parameter = 0 select falling edge and parameter = 1 select rising edge.

Master (PC / PLC) sends	Device responds	Result
TE	**E:001**	Request: TE=1
TE_0	**OK**	Setting: TE=0

Factory default: 0 [falling edge]

Note: This command cannot be used together with the TL command.

TR Trigger **RPDO2 [00 80]**

[This command will start the measuring cycle in the same way as the hardware trigger input.]

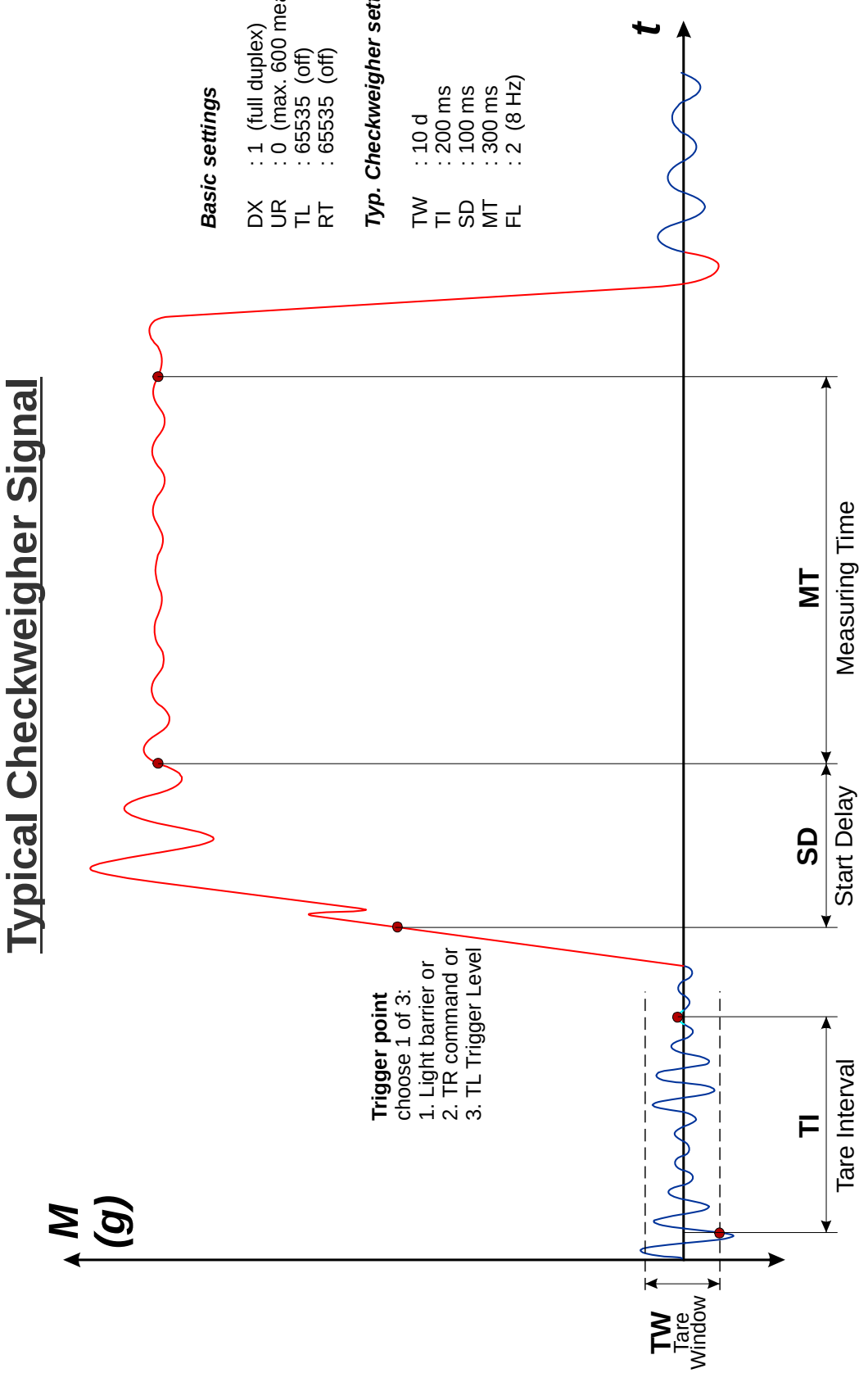
Master (PC / PLC) sends	Device responds	Result
TR	**OK**	Trigger started

Note: This function can be used as a soft trigger in a check weigher application (firmware 102.183).

[Special returned values are:
- 99999 = trigged measurement in progress
- 88888 = Re-Trigger in progress
- 99996 = Tried to change Tare or Zero before end of measurement]

[The Trigger function can also be stopped by sending 01 instead of 80 with RPDO2 [00 01].]

Factory default: 199999


Typical Checkweigher Signal
Basic settings
DX : 1 (full duplex)
UR : 0 (max. 600 meas./s)
TL : 65535 (off)
RT : 65535 (off)
Typ. Checkweigher settings
TW : 10 d
TI : 200 ms
SD : 100 ms
MT : 300 ms
FL : 2 (8 Hz)
M (g)
t
Trigger point
choose 1 of 3:
1. Light barrier or
2. TR command or
3. TL Trigger Level
TW Tare Window
TI Tare Interval
SD Start Delay
MT Measuring Time

5.10 Trigger Special Commands– RW, TT, TS, DT, TW, TI, HT

Remark: These commands are only available in **firmware 102.183.v.1.10.**

Note: All setups should be stored with the **WP** command before power off.

RW Re-Trigger Window **[2500sub03]**

Set the re-trigger window in counts (digits) without decimal point. If the weight relative to the current average value changes by more than the RW value the average cycle will be restarted using TT as measure time.To automatically issue the re-trigger command, the time period over which an increase of weight average is measured has to be defined by using the command DT. Permitted values are 0 …65535 counts.

Master (PC / PLC) sends	Device responds	Result
RW	**R+65535**	Request: RW=65535
RW_500	**OK**	Setting: RW=500d

Factory default: 65535

TT Re-Trigger Time **[2500sub04]**

Set the re-trigger time in milliseconds [ms]. Re-trigger time is the average time used by the re-trigger function. If set to zero the re-trigger function is disabled.
Permitted values are 0 …65535 ms.

Master (PC / PLC) sends	Device responds	Result
TT	**T+65535**	Request: TT=65535
TT_300	**OK**	Setting: TT=300ms

Factory default: 65535

TS Re-Trigger Stop **[2500sub08]**

Set the re-trigger stop in counts (digits) without decimal point. In case of a (TS) decrease in weight relative to the current average value the re-trigger function is stopped.
Permitted values are 0 …65535 counts.

Master (PC / PLC) sends	Device responds	Result
TS	**T+00000**	Request: TS=00000
TS_480	**OK**	Setting: TT=480d

Factory default: 00000

[The Re-Trigger function can also be stopped by sending 01 instead of 80 with RPDO2 [00 01].]

DT Delta Time **[2500sub0B]**

Set the Delta Time in milliseconds [ms]. During MT and TT timeframes "sub-averages" will be calculated by the system over the time DT. If a sub-average is outside the re-trigger window, the re-trigger function is automatic started. Permitted values are 0 …65535 ms.

Master (PC / PLC) sends	Device responds	Result
DT	**T+00000**	Request: DT=00000
DT_50	**OK**	Setting: TT=50ms

Factory default: 00000

TW Tare Window **[2500sub06]**

Set the Tare Window in in counts (digits) without decimal point. Tare window (TW) allows an automatic Tare update. If TW = 0 this function is not active. If TW = 100, this means a new tare value will be taken when the net average weight of an empty scale is within 100 counts or division of zero. The new average tare value is calculated over the average tare time defined by TI. If the tare average is outside tare window, the tare will not be updated. Permitted values are 0 …65535 counts.

Master (PC / PLC) sends	Device responds	Result
TW	**T+00000**	Request: TW=00000
TW_100	**OK**	Setting: TW=100d

Factory default: 00000

TI Tare Time **[2500sub07]**

Set the Tare Time in milliseconds [ms]. During the Tare Time a “tare-average” will be calculated by the system. Permitted values are 0 …65535 ms.

Master (PC / PLC) sends	Device responds	Result
TI	**T+00000**	Request: TI=00000
TI_200	**OK**	Setting: TI=200ms

Factory default: 00000

HT Hold Time **[2500sub05]**

Set the Hold Time in milliseconds [ms]. During the Hold Time the weight value must be over setpoint that a digital output can be switched. This means that a short signal peak will not lead to the switching of a digital output. Permitted values are 0 …65535 ms.

Master (PC / PLC) sends	Device responds	Result
HT	**T+00000**	Request: HT=00000
HT_200	**OK**	Setting: HT=200ms

Factory default: 00000

5.11 Save calibration, setup & setpoint parameters Commands – CS, WP, SS

The setup and calibration parameters can be divided into 3 groups:

- Calibration parameter: CZ, CG, DS, DP & ZT are saved by the CS command.
- Setup parameters (other than setpoint): FL, FM, NR, NT, BR, AD, etc. are saved by the WP command.
- Setpoint parameters: Sn, Hn and An are saved by the SS command.

CS Save the calibration parameters **[2004sub02]**

Note: Calibration parameters can only be saved if the TAC code is known and precedes the CS command. See the CE and CS commands on page 27 / 29.

Both the setup parameters and the setpoint parameters are stored in EEPROM using the WP and SS commands respectively.

WP Save the setup parameters **[2004sub03]**

With this command the settings of the “Filter” (FL, FM) , the “No-Motion” (NR, NT) and the communication (AD, BR) will be saved in the EEPROM.

Master (PC / PLC) sends	Device responds	Result
WP	**OK**	Parameter saved
WP	**ERR**	Error

SS Save the “setpoint” set-up parameters **[2004sub05]**

With this command the settings of the setpoints (Sn), the “setpoint hysteresis” (Hn) and the “setpoint action” (An) will be saved in the EEPROM.

Master (PC / PLC) sends	Device responds	Result
SS	**OK**	Parameter saved
SS	**ERR**	Error

DECLARATION OF CONFORMITY

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Product:	Digital load cell
Manufacturers designation:	PC6D
Manufacturer:	Flintec GmbH, Bemannsbruch 9, DE74909 Meckesheim, Germany

As manufacturer of the article we herewith assures that the article meets the requirements of the European legislation covering technical instruments, the standard safety rules, other safeguard regulations as well as the generally approved rules for technical safety, environmental protection and electromagnetic compatibility. It is further assured that the articles are in accordance with the supporting documents as supplied by the manufacturer.

To ensure this the necessary monitoring measures during production have been met.

We, the manufacturer, are under obligation to produce to relevant parties upon request written supporting evidence or by other means i.e. factory visits, spot checks etc. that the production requirements have been met.

Electronic articles have been manufactured and tested according to the following regulations:

Safety regulations:	CENELEC EN 60742
Electromagnetic Compatibility:	EN 55011 and EN 61000.

and further requirements as listed in the order specifications as agreed upon.

Meckesheim, April 20, 2007

Signature:

i.V. Gisbert Greulich

Being the responsible person employed and appointed by Flintec GmbH

Zertifiziertes Management-System ZDH ZERT DIN EN ISO 9001

Reg.-Nr.: Q1 0204001